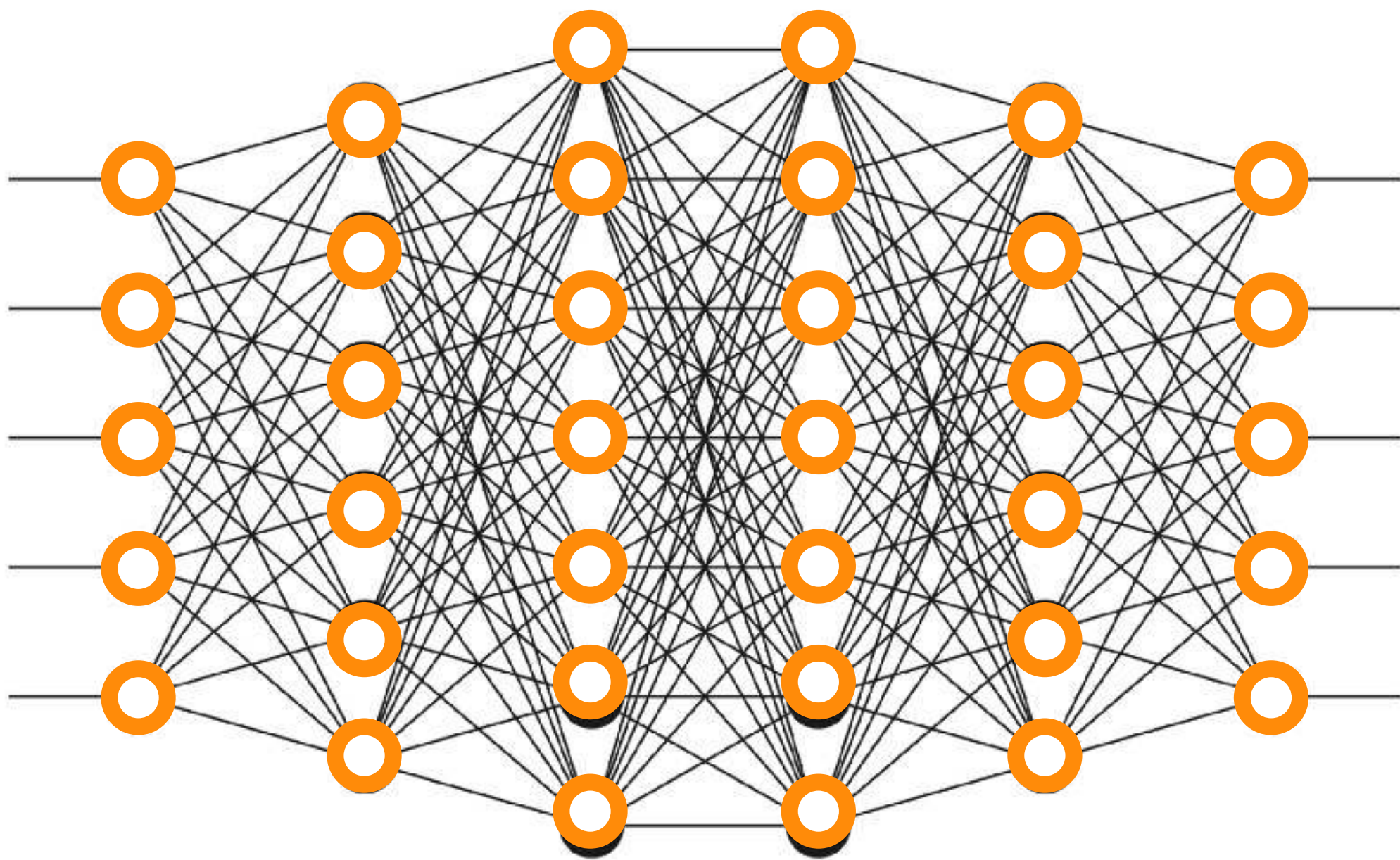


LEARN

DEEP LEARNING

in 6 Weeks



DEEP LEARNING



Disclaimer

Mastering deep learning in just 6 weeks is an ambitious goal.

This plan aims to provide a **solid foundation** and equip you with the **basic skills** to continue learning and build upon.



WEEK 1

Deep Learning Fundamentals



Topics

- Introduction to Deep Learning: Definition, Applications
- Artificial Neural Networks: Structure, Activation Functions, Loss Functions
- Gradient Descent Optimization: Basic Principles, Learning Rate
- Introduction to Python Libraries: NumPy, Pandas, Matplotlib (for basic understanding)



Self-Test Questions

- Explain the difference between supervised and unsupervised learning.
- Describe the role of an activation function in a neural network.
- What is the purpose of gradient descent optimization?
- Briefly explain the functionalities of NumPy and Pandas.



Project

- Implement a simple Perceptron algorithm for binary classification using Python libraries.



WEEK 2

Feedforward Neural Networks



Topics

- Multi-layer Perceptrons: Architecture, Backpropagation Algorithm
- Common Activation Functions: Sigmoid, ReLU, Softmax
- Introduction to Overfitting and Regularization Techniques



Self-Test Questions

- Multi-layer Perceptrons: Architecture, Backpropagation Algorithm
- Common Activation Functions: Sigmoid, ReLU, Softmax
- Introduction to Overfitting and Regularization Techniques



Project

- Build a multi-layer perceptron model from scratch (without libraries) to classify handwritten digits using the MNIST dataset.



Convolutional Neural Networks (CNNs)

→ Topics

- Introduction to CNNs: Convolutional layers, Pooling layers, Filters
- Applications of CNNs: Image Recognition, Object Detection
- Introduction to Hyperparameter Tuning: Learning rate, number of filters, etc.

🗨️ Self-Test Questions

- Describe the functionality of a convolutional layer in a CNN.
- Explain the different types of pooling operations used in CNNs.
- Why is hyperparameter tuning crucial in deep learning models?

📄 Project

- Implement a simple CNN architecture (without using libraries) to classify images of different categories (e.g., cats vs. dogs).



Recurrent Neural Networks (RNNs)



Topics

- Understanding Sequence Data: Time Series, Text, Natural Language Processing (NLP)
- Introduction to RNNs: Vanilla RNN, Long Short-Term Memory (LSTM) networks
- Applications of RNNs: Machine translation, sentiment analysis, music generation



Self-Test Questions

- Differentiate between traditional neural networks and RNNs.
- Explain the vanishing gradient problem in RNNs and how LSTMs address it.
- Describe two applications of RNNs in the field of NLP.



Project

- Implement a simple RNN model (without using libraries) to predict the next word in a sequence, given a starting sentence.



WEEK 5

Generative Adversarial Networks (GANs)



Topics

- **Focus:** Deep dive into Generative Adversarial Networks (GANs)
- Understanding the architecture and training process of GANs
- Applications of GANs: Image generation, data augmentation, style transfer
- Introduction to Ethical Considerations in Deep Learning: Bias, Fairness, Explainability



Self-Test Questions

- Explain the concept of a Generative Adversarial Network (GAN).
- Describe the two main components of a GAN and their roles.
- Discuss one ethical concern related to the use of GANs and potential mitigation strategies.



Deep Learning Project Exploration



Work on a Project:

- 1. Choose a project:** Consider your interests, skill level, and available resources (data, computing power).
- 2. Define the problem:** Clearly articulate what your project aims to achieve and the specific task it will perform.
- 3. Gather data:** Find or create a suitable dataset for your chosen task. Ensure data quality and relevance.
- 4. Select and experiment with models:** Choose a suitable deep learning model for your project (e.g., CNN for image recognition, RNN for text processing). Experiment with different architectures and hyperparameters (learning rate, batch size, etc.) to optimize performance.
- 5. Evaluate and improve:** Evaluate your model's performance using relevant metrics (accuracy, precision, recall, etc.). Identify areas for improvement and iterate on your model and training process.
- 6. Document and present your work:** Document your project's journey, including data sources, model architecture, code, and evaluation results. Prepare a presentation or report summarizing your findings.


Project Ideas:

- **Image Classification:** Extend your CNN from Week 3 to a more complex dataset (e.g., CIFAR-100, Fashion MNIST) with more categories.
- **Time Series Forecasting:** Train an RNN or LSTM model to predict stock prices, weather patterns, or website traffic.
- **Chatbot Development:** Build a simple chatbot using natural language processing techniques like sentiment analysis and sequence-to-sequence learning.
- **Music Generation:** Train an RNN model on a music dataset to generate new melodies or complete existing ones.
- **Object Detection in Images:** Utilize pre-trained models like YOLO or SSD to detect objects in images or videos.
- **Anomaly Detection:** Train a model to identify unusual patterns in data, such as fraudulent transactions or equipment failure.



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Lavanya
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Rahul




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